A *Difcourfe proving from* Experiments, *That the larger the* Wheels *of a* Coach, *&c. are (cæteris paribus,) the more eafily they may be drawn over a* Stone *or fuch like obftacle that lies in the way:* by *a Member of the* Philofophical Society *of* Oxford.

Aving read in the Mechanicks of Merfennus[a], Herigon[b], and Dr. Wallis[c], *That the larger the Wheels of a Coach, &c. are, (cæteris paribus,) the more eafily they may be drawn over a ftone or fuch like obftacle that lies in their way;* I was willing to try fome Experiments which I thought might convince fome men better of the truth of it, then a Mathematicall demonftration.

I therefore ordered a Modell of a part of a *Wagon* to be made, confifting of 4 wheels, 2 axes and a board nailed upon the axes. The leffer wheels were $4\frac{1}{3}$ inches high, and the bigger wheels $5\frac{2}{3}$ inches high, *viz:* $\frac{1}{12}$ of the ordinary height of the wheels of a *Wagon:* The weight of the Modell was almoft a pound and half. I had alfo 2 other wheels made $5\frac{2}{3}$ inches high to be put on inftead of the leffer. The middle of the 2 axes were $6\frac{1}{4}$ inches afunder. All the wheels turned very eafily upon the axes.

A piece of Lead $50\frac{3}{4}$ avoirdupois was laid upon the modell, fo forward that the leffer wheels feemed to bear above parts of the weight. Then the modell was drawn with a ftring laid over a Pulley, the top whereof was $\frac{1}{4}$ of an inch higher then the top of the hinder axis;

[a] Geom. pa. 459 [b] Mec. pr. 16. Schol. [c] Mec. c 7. pr. 3 Schol. § 15.

and

and the middle of this Pulley was $7\frac{1}{2}$ inches from the middle of the fore-axis.

The leſſer wheels being put on, and the ſtring being tied to the top of their axis,

1. Three pound drew the modell on the ſmooth levell Table.

2. Twenty pound drew the leſſer wheels over a ſquared rod $\frac{1}{4}$ of an inch thick.

3. Thirty pound drew them over a round rod a little more then half an inch thick.

4. Thirty one pound drew them over a ſquare rod half an inch thick.

5. Twelve pound drew the hinder wheels over the bigger ſquare rod.

The ſtring being laid under the axis, viz: $\frac{5}{8}$ of an inch lower then before.

6. Twenty nine pound drew the leſſer wheels over the bigger ſquare rod.

Then the 2 bigger wheels being put on inſtead of the leſſer, and the ſtring lying over the axis.

7. Three pound drew the modell on the Table.

8. Twenty five pound drew the Fore-wheels over the round rod.

9. Twenty five pound drew them over the bigger ſquare rod.

10. The ſtring lying under the axis, ſixteen pound drew them over the leaſt rod.

11. Twenty three pound drew them over the round rod.

12. Twenty three pound drew them over the bigger ſquare rod.

13. Thirteen pound drew the hinder wheels over the bigger ſquare rod.

All theſe Experiments were tried twice at leaſt, and moſt of them 3 or 4 times over

In all of them the Lead was laid exactly upon the

D 2   ſame

fame part of the board, but yet when the leffer wheels
were taken off, the Lead did not lean fo much forward,
fo that the hinder wheels were fomewhat more preffed
than they were before.

By comparing the 2d, 3d and 4th Experiments with
the 10th, 11th, and 12th, it appears how much more
eafily a *Wagon*, &c. might be drawn in rough wayes, if
the fore-wheels were as high as the hinder wheels, and
if the thills were fixt under the axis. Such a *Wagon* as
this would likewife be drawn more eafily where the
wheels cut in Clay, or Sand, or any foft Ground. And
moreover high wheels would not cut fo deep as low
wheels, as *Dr. Wallis* does plainly demonftrate [d]; befides
fome other advantages which he mentions.

Low wheels are better for turning in a narrow Com-
pafs than high ones: But it feems probable that *Wagons*
with 4 high wheels might be fo contrived that there
fhould be no great inconvenience in that refpect; at
leaft fuch *Wagons* as feldome have occafion to turn fhort,
as Carriers *Wagons* and fuch like.

The difference which you may obferve in the 8th and
11th Experiments, is agreeable to what is faid by *S. Ste-
vinus* [e], and *Dr. Wallis* [f]; viz. *that if a Coach, &c. muft
be drawn over rough, uneven places, it is beft to fix the Tra-
ces to the Coach lower then the height of the Horfes fhoulders.*
And therefore that is not the beft way which fome *Wa-
goners* ufe, who fometimes putting their horfes in pairs,
hook the chains of fome of the Horfes to the cheft of the
Wagon higher then they need to do.

14. A Table 2½ foot long was fet with one end 8½ inches
higher then the other end, and the Modell being loaded
as before, lefs weight by 6 ounces drew it up the Table
when the 4 bigger wheels were on, then when 2 bigger
and 2 lefs were on.

d Mec. c. 7. pr. 3. Schol. §. 21. e Stat. l. 3. pr. 9. f Mec. c. 7. pr. 3 §. 36.

The

The reafon of this is given by Dr. *Wallis* ꝿ and other Writers of Mechanicks: *viz.* becaufe in the firft cafe there was almoft the fame direction of the motion of the Modell and of the ftring that drew it; but not in the 2d cafe when the fore axis was fo much lower then the top of the Pulley.

ꝿ Mech. c. 7. pr. 3. §. 36.

D 3   *An Extra.*